

# AVMA Guidelines on Euthanasia

(Formerly Report of the AVMA Panel on Euthanasia)

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June 2007



**Caution** - The AVMA Guidelines on Euthanasia (formerly the 2000 Report of the AVMA Panel on Euthanasia) have been widely misinterpreted. Please note the following:

- The guidelines are in no way intended to be used for human lethal injection.
- The application of a barbiturate, paralyzing agent, and potassium chloride delivered in separate syringes or lines (the common method used for human lethal injection) is not cited in the report.
- The report never mentions pentothal sodium bromide or Pavulon, the paralyzing agent used in human lethal injection.

## NONINHALANT PHARMACEUTICAL AGENTS

The use of injectable euthanasia agents is the most rapid and reliable method of performing euthanasia. It is the most desirable method when it can be performed without causing fear or distress in the animal. When the restraint necessary for giving an animal an intravenous injection would impart added distress to the animal or pose undue risk to the operator, sedation, anesthesia, or an acceptable alternate route of administration should be employed. Aggressive, fearful, wild, or feral animals should be sedated or given a nonparalytic immobilizing agent prior to intravenous administration of the euthanasia agent.

When intravenous administration is considered impractical or impossible, intraperitoneal administration of a nonirritating euthanasia agent is acceptable, provided the drug does not contain neuromuscular blocking agents. Intracardiac injection is acceptable only when performed on heavily sedated, anesthetized, or comatose animals. It is not considered acceptable in awake animals, owing to the difficulty and unpredictability of performing the injection accurately. Intramuscular, subcutaneous, intrathoracic, intrapulmonary, intrahepatic, intrarenal, intrasplenic, intrathecal, and other nonvascular injections are not acceptable methods of administering injectable euthanasia agents.

When injectable euthanasia agents are administered into the peritoneal cavity, animals may be slow to pass through stages I and II of anesthesia. Accordingly, they should be placed in small cages in a quiet area to minimize excitement and trauma.

### BARBITURIC ACID DERIVATIVES

Barbiturates depress the central nervous system in descending order, beginning with the cerebral cortex, with loss of consciousness progressing to anesthesia. With an overdose, deep anesthesia progresses to apnea, owing to depression of the respiratory center, which is followed by cardiac arrest.

All barbituric acid derivatives used for anesthesia are acceptable for euthanasia when administered intravenously. There is a rapid onset of action, and loss of consciousness induced by barbiturates results in minimal or transient pain associated with venipuncture. Desirable barbiturates are those that are potent, long-acting, stable in solution, and inexpensive. Sodium pentobarbital best fits these criteria and is most widely used, although others such as secobarbital are also acceptable.

*Advantages—*(1) A primary advantage of barbitu-

rates is speed of action. This effect depends on the dose, concentration, route, and rate of the injection. (2) Barbiturates induce euthanasia smoothly, with minimal discomfort to the animal. (3) Barbiturates are less expensive than many other euthanasia agents.

*Disadvantages—*(1) Intravenous injection is necessary for best results and requires trained personnel. (2) Each animal must be restrained. (3) Current federal drug regulations require strict accounting for barbiturates and these must be used under the supervision of personnel registered with the US Drug Enforcement Administration (DEA). (4) An aesthetically objectionable terminal gasp may occur in unconscious animals. (5) These drugs tend to persist in the carcass and may cause sedation or even death of animals that consume the body.

*Recommendations—*The advantages of using barbiturates for euthanasia in small animals far outweigh the disadvantages. Intravenous injection of a barbituric acid derivative is the preferred method for euthanasia of dogs, cats, other small animals, and horses. Intraperitoneal injection may be used in situations when an intravenous injection would be distressful or even dangerous. Intracardiac injection must only be used if the animal is heavily sedated, unconscious, or anesthetized.

### PENTOBARBITAL COMBINATIONS

Several euthanasia products are formulated to include a barbituric acid derivative (usually sodium pentobarbital), with added local anesthetic agents or agents that metabolize to pentobarbital. Although some of these additives are slowly cardiotoxic, this pharmacologic effect is inconsequential. These combination products are listed by the DEA as Schedule III drugs, making them somewhat simpler to obtain, store, and administer than Schedule II drugs such as sodium pentobarbital. The pharmacologic properties and recommended use of combination products that combine sodium pentobarbital with lidocaine or phenytoin are interchangeable with those of pure barbituric acid derivatives.

A combination of pentobarbital with a neuromuscular blocking agent is not an acceptable euthanasia agent.

### CHLORAL HYDRATE

Chloral hydrate depresses the cerebrum slowly; therefore, restraint may be a problem for some animals. Death is caused by hypoxemia resulting from progressive depression of the respiratory center, and may be


# Appendix 1—Agents and methods of euthanasia by species

Agents and methods of euthanasia by species (refer to Appendix 4 for unacceptable agents and methods.)

Species	Acceptable* (refer to Appendix 2 and text for details)	Conditionally acceptable† (refer to Appendix 3 and text for details)
Amphibians	Barbiturates, inhalant anesthetics (in appropriate species), CO <sub>2</sub> , CO, tricaine methane sulfonate (TMS, MS 222), benzocaine hydrochloride, double pithing	Penetrating captive bolt, gunshot, stunning and decapitation, decapitation and pithing
Birds	Barbiturates, inhalant anesthetics, CO <sub>2</sub> , CO, gunshot (free-ranging only)	N <sub>2</sub> , Ar, cervical dislocation, decapitation, thoracic compression (small, free-ranging only), <u>maceration</u> (chicks, poults, and pipped eggs only)
Cats	Barbiturates, inhalant anesthetics, CO <sub>2</sub> , CO, potassium chloride in conjunction with general anesthesia	N <sub>2</sub> , Ar
Dogs	Barbiturates, inhalant anesthetics, CO <sub>2</sub> , CO, potassium chloride in conjunction with general anesthesia	N <sub>2</sub> , Ar, penetrating captive bolt, electrocution
Fish	Barbiturates, inhalant anesthetics, CO <sub>2</sub> , tricaine methane sulfonate (TMS, MS 222), benzocaine hydrochloride, 2-phenoxyethanol	Decapitation and pithing, stunning and decapitation/pithing
Horses	Barbiturates, potassium chloride in conjunction with general anesthesia, penetrating captive bolt	Chloral hydrate (IV, after sedation), gunshot, electrocution
Marine mammals	Barbiturates, etorphine hydrochloride	Gunshot (cetaceans < 4 meters long)
Mink, fox, and other mammals produced for fur	Barbiturates, inhalant anesthetics, CO <sub>2</sub> (mink require high concentrations for euthanasia without supplemental agents), CO, potassium chloride in conjunction with general anesthesia	N <sub>2</sub> , Ar, electrocution followed by cervical dislocation
Nonhuman primates	Barbiturates	Inhalant anesthetics, CO <sub>2</sub> , CO, N <sub>2</sub> , Ar
Rabbits	Barbiturates, inhalant anesthetics, CO <sub>2</sub> , CO, potassium chloride in conjunction with general anesthesia	N <sub>2</sub> , Ar, cervical dislocation (< 1 kg), decapitation, penetrating captive bolt
Reptiles	Barbiturates, inhalant anesthetics (in appropriate species), CO <sub>2</sub> (in appropriate species)	Penetrating captive bolt, gunshot, decapitation and pithing, stunning and decapitation

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## POLICIES and GUIDELINES

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### The HSUS Statement on Euthanasia Methods for Dogs and Cats

One of the most critical responsibilities of those in the animal care and sheltering field is to provide the most humane death possible for dogs and cats when euthanasia is necessary. The term "euthanasia" is derived from Greek, meaning "good death." To be humane, every euthanasia technique must result in painless unconsciousness, followed by respiratory, then cardiac arrest, and ultimately death.

Animal sheltering personnel must consider many factors when choosing a method of euthanasia. The most important factor is the humaneness of the method. Other considerations include the number and types of animals handled, the number of employees available, the training available for euthanasia personnel, and legal limitations. Once an acceptable method has been chosen, shelter personnel must carefully maintain euthanasia equipment and keep an accurate inventory of euthanasia drugs to ensure both an adequate supply and the fulfillment of federal and state record-keeping requirements.

It is a binding obligation of shelter administrators to evaluate current euthanasia procedures frequently, ensure that animals are being properly handled, and verify that employees are competent, compassionate, and properly trained. Employees must be able to cope with euthanizing large numbers of animals while maintaining a concern for the well-being of each individual dog or cat. Euthanasia procedures should be clearly documented in writing to ensure consistency.

#### Sodium Pentobarbital

The Humane Society of the United States (HSUS) recommends the injection of sodium pentobarbital, prepared specifically for use as a euthanasia product, as the preferred agent for the euthanasia of dogs and cats. This method, when properly performed, has been found to be the most humane, safest, least stressful, and most professional choice by The HSUS, the American Veterinary Medical Association, the American Society for the Prevention of Cruelty to Animals, American Humane Association, and the National Animal Control Association.

The HSUS strongly believes that there should be two people involved in the euthanasia process: one to hold and calm the animals and one to inject the drug. Intravenous (IV) injection (into the vein) is considered to be the most rapid and reliable method of performing euthanasia by injection when it can be administered without causing fear or distress in the animal. Sodium pentobarbital may be administered by intraperitoneal (IP) injection (into the peritoneal cavity) to cats, kittens, and puppies if IV injections are difficult or impractical. The use of pre-euthanasia anesthetic drugs should be considered prior to administration of sodium pentobarbital to ensure safe and humane handling of aggressive, fearful or feral animals. Muzzling and other forms of humane constraint may also be used as needed.

Intracardiac (IC) injections (into one of the four chambers of the heart) are acceptable **only** for animals who have been verified as unconscious. An injection into a conscious animal's chest is stressful and extremely painful and therefore considered to be cruel. There are two methods of ensuring that an animal is unconscious before administering an IC injection, and **both** of these methods should be used in every case:

- Push against the cornea of the eye and check for a blink reflex. If the animal blinks, the animal is not unconscious.
- Pinch the web (tissue between the toes) of the rear paw firmly with the fingers or a pair of hemostats and check for a withdrawal reflex. If the animal pulls back, the animal is not unconscious.

Because intrahepatic (IH) injections (into the liver) have not yet been sufficiently studied, The HSUS is opposed to IH injections. Questions remain regarding the accuracy of injection, organ sensitivity to pain, suitability for multiple species, and

smooth induction of the animal into unconsciousness.

In addition, the following euthanasia injection routes are **not** acceptable: subcutaneous (under the skin), intramuscular (into the muscle), intrapulmonary (into the lung), intrarenal (into the kidney), intrasplenic (into the spleen), intrathecal (into the membranes of the spinal cord), intrathoracic (into the chest cavity), and any other nonvascular injection route.

Sodium pentobarbital is a Schedule II barbiturate, which means it is a federally controlled substance; it can only be purchased using a Drug Enforcement Administration (DEA) registration and order form, and is subject to federal security and record-keeping requirements. Its use is also carefully controlled by state laws and regulations.

#### Pentobarbital Combinations

Any combination of sodium pentobarbital with a neuromuscular blocking agent is **absolutely unacceptable** for euthanasia. There are, however, other combination products on the market, which combine sodium pentobarbital with another drug to hasten cardiac arrest. The combination line of products is only approved for use in dogs and can only be administered by intravenous or intracardiac injection. With other injection routes, there are concerns that cardiotoxic properties may cause cardiac arrest before the animal is fully unconscious. Again, intracardiac injections may **only** be performed when an animal is unconscious (as specified in above section).

Because the sodium pentobarbital is combined with another drug, the DEA has classified the combined product as a Schedule III controlled substance, with less potential for abuse. Schedule III drugs can be obtained directly from the manufacturer by anyone with a DEA registration; no order form is required. However, Schedule III drugs are subject to the same security and record-keeping requirements as Schedule II drugs.

#### Carbon Monoxide (CO)

Carbon monoxide (CO) is not an acceptable method of euthanasia where sodium pentobarbital can be legally obtained by shelters. The many limitations of CO make the method less practical, considerably slower, and more expensive than lethal injection. For those states where shelters cannot legally obtain, use, and administer sodium pentobarbital, The HSUS considers the use of CO a **conditionally** acceptable method of euthanasia for some animals when delivered by a commercially manufactured and properly equipped chamber. Only cool bottled, commercial-grade gas must be used; engine or chemically-generated gas is not acceptable due to impurities and heat, which make its use painful and inhumane. The HSUS urges all agencies currently using CO to partner with a local veterinarian who can perform euthanasia by injection and to contact your legislators to inform them of the need for direct licensing to enable sheltering agencies to purchase sodium pentobarbital. It is always unacceptable to use CO for the euthanasia of dogs and cats who are:

- Geriatric;
- Under the age of four months;
- Sick or injured; or
- (Obviously) pregnant.

Old, sick, or injured animals may have poor blood pressure or weak hearts, which may delay the effects of CO, causing them to experience distress prior to unconsciousness. Animals under the age of four months may not have the lung capacity to inhale enough CO to be effective. In pregnant animals, it is likely that the mother will die from exposure to CO before the unborn puppies/kittens. Consequently, it is possible that the puppies/kittens will die as a result of the mother's death (by suffocating to death) rather than from exposure to CO. The HSUS condemns using CO for animals meeting the above criteria.

Because of these limitations, there must always be an acceptable backup method available, namely sodium pentobarbital. In most cases, agencies without access to sodium pentobarbital will need to contract with a local veterinarian to have sodium pentobarbital administered to these animals. Again, agencies without legal

accessibility to sodium pentobarbital should explore the possibility of partnering with local veterinarians to perform routine euthanasia as well.

#### Human Health Risks Posed by CO

Staff must be fully notified of the potential health risks involved with using CO. Carbon monoxide is a hazardous substance: it is highly toxic and has no odor, no color, and no taste. It is one of the leading causes of accidental poisoning in the United States and repeated exposure to CO, even at low levels, can result in long-term effects, including (but not limited to) impaired memory, breathing difficulties, muscle weakness, heart irregularity, and brain damage. Exposure among pregnant women can cause low birth weight in their infants. The use of a CO chamber should be closely monitored and in compliance with Occupational Safety and Health Administration (OSHA) requirements. Again, CO should be considered **only** for agencies unable to legally obtain sodium pentobarbital.

The HSUS is working to change the laws to allow all animal care and control agencies to legally obtain sodium pentobarbital (see [Direct Licensing Laws for Euthanasia in Animal Shelters](#)). Alert your government officials that the use of CO by animal care and control agencies is being phased out across the nation and replaced with the more humane method of sodium pentobarbital injection. Every effort must be made to ensure the safety of shelter workers and to provide a painless and rapid humane euthanasia for animals.

For specific guidelines on the use of carbon monoxide (CO), see [Appropriate Use of Carbon Monoxide for Animal Euthanasia](#).

#### Pre-euthanasia Anesthetic Drugs

Pre-euthanasia anesthetic drugs are often necessary to safely and humanely handle excited, fractious, or dangerous animals for euthanasia. The administration of these drugs requires minimal handling of the animal and a simple intramuscular injection. Most pre-euthanasia drugs are Schedule III controlled substances and must be handled and secured to ensure compliance with state and federal laws.

There are a variety of drugs that are commonly used for pre-euthanasia anesthesia. The terms tranquilization, sedation, immobilization, and anesthesia are often used interchangeably. However, it is imperative to understand the differences among these words and which drug(s) offer what effect.

**Tranquilization:** An animal usually remains awake but is calm, relaxed, and may fall asleep. The animal feels pain. A tranquilized animal can be unpredictable and may have a heightened reaction to a sufficient stimulus, posing potential danger to staff. Acepromazine is a common tranquilizer used with animals.

**Sedation:** An animal falls into a sleep-like state and becomes uncoordinated with relaxed muscles. There is a decreased ability to feel pain (analgesia). Sedated animals are also unpredictable and may be aroused when stimulated. Xylazine is a common sedative used with both large and small animals.

**Immobilization:** An animal is paralyzed and unable to move. The body may become rigid and stiff. Generally animals are unresponsive to sight and sound, but they can feel deep pain. Ketamine is a common immobilizing agent used in cats.

**Anesthesia:** An animal is unconscious, has a total loss of feeling pain, and is immobilized, yet the vital functions remain normal. Examples of anesthetic agents are tiletamine-zolazepam (Telazol®) or a mixture of ketamine-xylazine. Both of these drugs/drug combinations offer good anesthesia and allow for an intracardiac injection of sodium pentobarbital when properly administered.

#### Inhumane Methods

The HSUS considers inhumane, disapproves of, and campaigns against the following methods when used for euthanasia:

- **Gunshot**—Gunshot is absolutely not acceptable for routine shelter euthanasia. Gunshot is **only** acceptable in an emergency field situation where an animal cannot be confined and transferred to the shelter, sodium pentobarbital is unavailable, and the personnel are well trained in the use of gunshot. This method is highly dangerous to personnel.
- **Carbon Dioxide (CO<sub>2</sub>)**—CO<sub>2</sub> is not acceptable for use in animal care and control facilities for the euthanasia of dogs and cats. CO<sub>2</sub> produced from dry ice or generated from any other method is unacceptable.
- **T-61**—T-61 is an unacceptable injectable drug combination containing a local anesthetic, a general anesthetic, and a neuromuscular blocking agent. It has been removed from the market by its manufacturer in the United States, but is still available in Canada. It is intended to be given intravenously at a precise rate of injection (1cc for 5 seconds) that is almost impossible to maintain. Most importantly, if improperly administered, T-61 can cause animals intense pain after administration and a curare-like paralysis of respiration (suffocation) before the animal loses consciousness. Because of these limitations, T-61 is an unacceptable euthanasia agent.
- **Other methods that The HSUS considers inhumane**—and which are illegal in many if not most jurisdictions—include decompression, the use of kill traps, nitrous oxide, drowning, decapitation, cervical dislocation, thoracic compression, pithing, exsanguination, electrocution, air embolism, nitrogen flushing, strychnine, chloral hydrate, caffeine, nicotine, magnesium sulfate, potassium chloride, succinylcholine chloride (Sucostrin, U-Tha-Sol, Anectine, Quelicin Chloride, Scoline Chloride), and any combination of sodium pentobarbital with a neuromuscular blocking agent.

#### For More Information

The Humane Society of the United States is committed to recommending only those methods of euthanasia that are painless, rapid, and—to the fullest extent possible—minimize fear and apprehension in the animal. The HSUS is actively working to change state laws to allow local sheltering agencies access to sodium pentobarbital through direct licensing (see [Direct Licensing Laws for Euthanasia in Animal Shelters](#)). If you would like information on how to help in this effort, please contact The HSUS Government Affairs Department at 202-452-1100 or [Legislation@hsus.org](mailto:Legislation@hsus.org).

[Humane Society University](#) offers euthanasia and compassion fatigue training around the country and The HSUS has published an instructional book on euthanasia entitled *The Humane Society of the United States Euthanasia Training Manual*. The manual covers euthanasia methods for a variety of animal species including wildlife.

To see the Carbon Monoxide vs. Sodium Pentobarbital Cost Analysis Worksheet, please reference Table 14.1 in *The Humane Society of the United States Euthanasia Training Manual*. To see the May 2004 investigation of carbon monoxide (CO) exposures related to the use of CO euthanasia chambers by the National Institute for Occupational Safety and Health and the Centers for Disease Control and Prevention, visit [www.cdc.gov/niosh/hhe/reports/pdfs/2004-0123-2939.pdf](http://www.cdc.gov/niosh/hhe/reports/pdfs/2004-0123-2939.pdf).

For a standard operating procedures sample template for euthanasia and controlled substances, contact our Animal Sheltering Issues at [asi@hsus.org](mailto:asi@hsus.org).

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# INTRACARDIAC INJECTIONS

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## 10.1 Introduction

**A**N INTRACARDIAC (IC) INJECTION is administered directly into one of the four chambers of an animal's heart. The primary advantage of this type of injection is that it is the most rapidly acting, usually causing death in a matter of seconds. The main disadvantage is that it should never be administered on conscious animals because of pain, distress, or suffering. The IC injection must only be used on animals who are already unconscious.

## 10.2 Needle Size

**B**ECAUSE THE HEART is much further below the skin surface than is a vein, it is necessary to use a one- and one-half inch needle for IC injections. A minimum of a one-inch needle should be used on cats and smaller animals. It may be necessary to use a two-inch needle on deep-chested animals, such as Saint Bernards.

## 10.3 Ensuring the Animal is Unconscious

**T**WO METHODS ARE commonly used to ensure that an animal is unconscious after administration of pre-euthanasia anesthetic. The first is to check for a blink reflex. The eye should be gently pushed against and observed. If no blinking takes place, the animal is in a deep anesthetic plane and may be given an IC injection. The second is to test the upper rear paw for a withdrawal reflex prior to giving an IC injection. If the animal pulls his or her leg back after having the skin, or web, between the rear toes firmly pinched with fingers or a pair of hemostats, he or she can still feel pain and the IC injection should not be given. Either additional time is needed for the animal to go completely unconscious or an additional pre-euthanasia anesthetic or IP injection (for cats only) or IV injection should be administered.







## 10.4 Locating the Injection Site

**T**HE RECOMMENDED SITE for an IC injection is on the animal's lower left side in the fourth, fifth, or sixth intercostal spaces (spaces between the ribs). A good indicator for the correct position is the animal's left elbow. While the animal is lying on his or her right side, the technician should bend the animal's left front leg in a right angle. At this angle, the injection site should be directly behind the animal's elbow (Fig. 10.1).

On most animals, the heartbeat can be palpated (felt) on the skin surface by using the fingers. The exact position will vary according to the animal's species, age, size, and weight. A stethoscope also can aid in locating the heart.

## 10.5 Administering the Injection

**THE NEEDLE SHOULD** be inserted at the point where the heartbeat feels the strongest. For an IC injection, the syringe may be held in any manner that is comfortable for the technician. The blood pressure in the heart is very powerful, and blood may be pushed into the syringe as soon as the needle enters the heart. Aspirate before making the injection to verify the location of the needle point. The objective is to inject into one of the chambers of the heart and, when aspirating, a large volume of blood should easily be withdrawn. (If only a small amount of blood is withdrawn, the needle may be incorrectly placed into heart muscle or the lung and another attempt must be made.)

Once the technician verifies that the needle is in the heart chamber, the injection should be completed at the standard 1 ml per second rate. The heartbeat should cease in most cases before the needle is withdrawn.

After the injection is completed, the needle should be withdrawn and the animal checked for terminal signs.

## Pigs killed after spilling from toppled truck

HELENA (AP) — A tractor trailer carrying live pigs overturned on Interstate 15 south of Basin Saturday afternoon, killing several of the animals.

The truck was heading south when it took a corner too fast, the Montana Highway Patrol said.

More than 50 pigs were killed, with patrol officers euthanizing several of the animals that were

severely injured.

The total number of pigs involved was not immediately known.

The truck driver was taken to St. Peter's Hospital with minor injuries.

## Cattle killed when tractor-trailer overturns

HELENA (AP) — Two animals were killed and two people were injured when a tractor-trailer carrying 42 head of cattle overturned Tuesday.

Helena police said the truck driver ran a red light on Highway 12 East and smashed into a car. Both drivers suffered minor injuries and were taken to St. Peter's Hospital. Their names were not released.

Livestock officials and local

authorities used portable corrals to gather the livestock, which were taken to a nearby fairgrounds for inspection.

"I can't imagine how it happened," said Stephanie Shell, a lumberyard employee who stopped to take pictures of the accident. "Only in Montana. When will you ever see cowboys like this in front of Staples?"

The cattle will be taken to a slaughterhouse in Utah.